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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/056,720	01/24/2002	Tomoki Kobayashi	IIW-016	2117

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LAHIVE & COCKFIELD, LLP.
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BOSTON, MA 02109

EXAMINER	
TSANG FOSTER, SUSY N	
ART UNIT	**PAPER NUMBER**
1745	

DATE MAILED: 02/25/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/056,720	KOBAYASHI ET AL.	
	Examiner	Art Unit	
	Susy N Tsang-Foster	1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 November 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-12 and 14-19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-12 and 14-19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. This Office Action is responsive to the amendment filed on 11/24/2004. Claims 1, 9, 12, 16, and 17 have been amended. Claim 13 has been cancelled. After further consideration of the original disclosure by the Examiner, the limitation of a high-pressure tank for storing compressed hydrogen gas at a pressure of at least about 1 MPa at a temperature of about 35 Celsius is not supported by the original disclosure. It is possible for a high-pressure tank to contain a hydrogen gas at about 1MPa equilibrium pressure at 35 °C as seen in Figure 1 of JP 60-68 A and the hydrogen gas does not necessarily have to be compressed. The original disclosure does not support that the high pressure tank must contain a compressed gas. As seen on page 18 of the substitute specification, the metal hydride tank 31 is a high-pressure gas-tight tank made of an aluminum alloy and can occlude hydrogen at a pressure of from 3 to 5 MPa. Furthermore, Figure 1 of JP 60-68 A shows that metal hydride tanks can withstand up to 70 atmospheres of pressure (about 7 MPa).

Claims 1-12, and 14-19 are pending and are rejected for reasons given below. This Office Action is made non-final as new grounds of rejection are made that are not necessitated by applicant's amendment.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it

pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 1-11 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

In claim 1, the limitation "a high-pressure tank for storing compressed hydrogen gas at a pressure of at least about 1 MPa at a temperature of about 35° Celsius" is not supported by the original disclosure. It is possible for a high-pressure tank to contain a hydrogen gas at about 1MPa equilibrium pressure at 35 °C as seen in Figure 1 of JP 60-68 A and the hydrogen gas does not necessarily have to be compressed. The original disclosure does not support that the high pressure tank must contain a compressed gas. As seen on page 18 of the substitute specification, the metal hydride tank 31 is a high-pressure gas-tight tank made of an aluminum alloy and can occlude hydrogen at a pressure of from 3 to 5 MPa. Furthermore, Figure 1 of JP 60-68 A shows that metal hydride tanks can withstand up to 70 atmospheres of pressure (about 7 MPa).

Similarly, in claim 9, the limitation "a high-pressure tank, which stores compressed hydrogen gas at a pressure of at least about 1 MPa at a temperature of about 35° Celsius" is not supported by the original disclosure for reasons given above.

Claims depending from claims rejected under 35 USC 112, first paragraph are also rejected for the same.

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 1-8 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 1, the limitation "the hydrogen discharged from said high-pressure tank" lacks antecedent basis within the claim because the limitation "a high-pressure tank for storing compressed hydrogen gas at a pressure of at least about 1 MPa" appears to recite the intended use of the high pressure tank and does not appear to positively recite that the high-pressure tank contains compressed hydrogen gas at a pressure of at least about 1 MPa.

Claims depending from claims rejected under 35 USC 112, second paragraph are also rejected for the same.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

7. Claims 1-12, and 14-19 are rejected under 35 U.S.C. 102(a) as being anticipated by WO00/58529 (equivalent document to Okada et al. (US 6,835,490 B1) relied upon for translation).

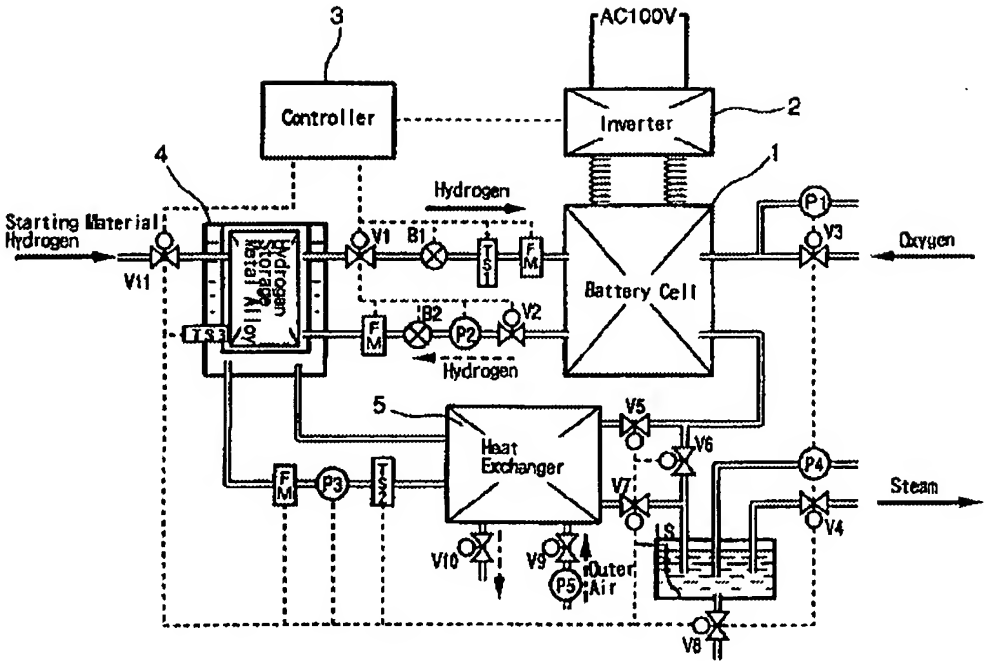
Okada et al. disclose a fuel cell apparatus (see Figure 21 reproduced below) comprising a fuel cell 1, a hydrogen metal hydride storage tank 4 that is capable of supplying the hydrogen occluded in the hydrogen storage metal alloy to the fuel cell, and a heat exchanger 5 that is carried out between the outer air as well as the discharged heat existing in a steam of relatively high temperature discharged from the fuel cell and the cold/warm water as a cooling medium circulated in a cooling/warming medium jacket installed at the outer circumference of the hydrogen metal hydride storage tank 4 (col. 17, lines 12-46). The controller 3 conducts various controls for elevating or lowering the temperature of the hydrogen storage metal alloy in the tank 4, mass control for pressure, flow rate, temperature, etc. with regard to the hydrogen supplied to the fuel cell (col. 17, lines 46-52).

The controller is capable of appropriately controlling a pressure, temperature, and flow rate of the hydrogen gas supplied from the hydrogen metal hydride storage tank to the fuel cell and the pressure, temperature and flow rate of hydrogen gas can be controlled whereby it is possible to control amounts of generated electric energy in the fuel cell depending appropriately upon the load and to enhance the utilizing efficiency of the hydrogen used in the fuel cell (col. 8, lines 22-33 and col. 18, lines 23-38).

The hydrogen which is to be absorbed with the hydrogen storage metal alloy is supplied as a starting material hydrogen into the tank 4 by connecting a high-pressure hydrogen cylinder to a hydrogen supplying outlet followed by opening the valve V1 whereupon the hydrogen storage metal alloy absorbs the hydrogen from the low-pressure plateau region to the high-pressure plateau region (col. 17, line 65 to col. 18, line 7 and col. 19, lines 8-32). The high-pressure hydrogen cylinder which is commercially available inherently has a compressed hydrogen gas at a pressure of at least about 1 MPa at a temperature of about 35 degree Celsius.

Simultaneously, the controller releases valves V9 and V10 and also makes pump P5 in an operating state whereby the outer air is sent to the heat exchanger to cool the above-mentioned cold/warm water with the outer air and at the same time, the hydrogen storage metal alloy is monitored with a temperature sensor and the circulation pump P3 is appropriately operated so as to bring the temperature (T1) of the hydrogen storage metal alloy to 40 degree Celsius or lower whereby the above heat-exchanged cold/warm water is appropriately passed into the above-mentioned cooling/warming medium jacket to carry out the cooling of the hydrogen storage metal alloy (col. 18, lines 7-23). During this process, the fuel cell is inherently warmed up by the circulating coolant stream.

Furthermore, the apparatus claims must be structurally distinguishable from the prior art (see MPEP 2114). A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987).



Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. Claims 12, 14, 15, 18 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over applicant's English Translation for JP 60-68 A submitted on 4/29/2004 in view of Kralick (US 6,350,535 B1).

The JP 60-68 A reference discloses a fuel cell apparatus comprising a fuel cell 15, a metal hydride 13 having a high hydrogen equilibrium dissociation pressure placed in tank 4 and a metal hydride 14 having a low hydrogen equilibrium dissociation pressure in tank 10 and the two tanks are coupled to each other through hydrogen transfer valves 11 and 12 (see also Figure 2). A heat exchanger 18 is contained in tank 10 and is coupled with a heat exchanger 16 which heats and cools the fuel cell 15 (see page 5 of applicant's translation). Page 5 of the translation also states that a "solvent for exchanging heat is transferred by means of a pump to circulate solvent so that heat can be smoothly transferred." Page 6 of the translation states "the heat is generated in the metallic hydride MH1 when hydrogen is occluded in the metallic hydride MH1. This heat can also be utilized to increase the temperature of the fuel cell so that the fuel cell can be started again at the time when the fuel cell is stopped."

Although JP 60-68 A discloses that the heat exchanger 18 is contained in tank 10, it also discloses on page 1 of applicant's translation of the reference that the heat exchanger is provided on each metal tank (see claim 2 of the reference) which implies that the heat exchanger can be located outside and on the metal tank.

The JP 60-68 A reference does not disclose that the solvent for exchanging heat is water, and that the fuel cell generates power while warming up the fuel cell when the temperature of the fuel cell is within a given temperature range whose upper limit is the prescribed temperature and the warming up is performed with no power generation when the temperature of the fuel cell is under the lower limit of the given temperature range.

Kralick teaches water as a heat exchange medium between a fuel cell and a heat exchanger (col. 5, lines 30-31) and that if the reactant gas entering the inlet is warmer than the fuel cell stack, condensation might occur as the saturated gas is cooled to the stack temperature (col. 5, lines 45-65).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use water as the solvent for exchanging heat between the fuel cell and the metal hydride tank 10 because water is commonly used in the art as a heat exchange medium in a coolant circuit because water is non-corrosive, has high heat capacity, is non-toxic, and is easily replenished by the product water of the fuel cell.

It would have also been obvious to one of ordinary skill in the art at the time the invention was made to warm up the fuel cell to a given temperature without power generation or to warm up the fuel cell to a given temperature with power generation because the optimum condition of power generation depends on the relative temperature of the humidified reactant and the temperature of the fuel cell because if a humidified reactant gas entering the fuel cell has a higher temperature that the fuel cell temperature, condensation might occur and cause flooding of the fuel cell membrane that would be detrimental to power generation.

If applicant disputes the Examiner's interpretation of the JP 60-68 A reference that the heat exchanger is located outside the heat exchanger because it is located on the metal tank as recited in claim 2 of the reference, it would have been obvious to one of ordinary skill in the art

at the time the invention was made to rearrange the heat exchanger from the inside of the tank to the outside of the tank in order to provide more space inside the tank for hydrogen storage.

The courts have held that the rearrangement of parts is obvious because it is an obvious matter of design choice. In re Japikse, 181 F.2d 1019, 86 USPQ 70 (CCPA 1950); In re Kuhle, 526 F.2d 553, 188 USPQ 7 (CCPA 1975).

10. Claims 12, 14, 15, 18 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over applicant's English Translation for JP 60-68 A submitted on 4/29/2004 in view of Kralick (US 6,350,535 B1) and Aldhart et al. (US Patent No. 4,826,741).

The JP 60-68 A reference discloses a fuel cell apparatus comprising a fuel cell 15, a metal hydride 13 having a high hydrogen equilibrium dissociation pressure placed in tank 4 and a metal hydride 14 having a low hydrogen equilibrium dissociation pressure in tank 10 and the two tanks are coupled to each other through hydrogen transfer valves 11 and 12 (see also Figure 2). A heat exchanger 18 is contained in tank 10 and is coupled with a heat exchanger 16 which heats and cools the fuel cell 15 (see page 5 of applicant's translation). Page 5 of the translation also states that a "solvent for exchanging heat is transferred by means of a pump to circulate solvent so that heat can be smoothly transferred." Page 6 of the translation states "the heat is generated in the metallic hydride MH1 when hydrogen is occluded in the metallic hydride MH1. This heat can also be utilized to increase the temperature of the fuel cell so that the fuel cell can be started again at the time when the fuel cell is stopped."

Although JP 60-68 A discloses that the heat exchanger 18 is contained in tank 10, it also discloses on page 1 of applicant's translation of the reference that the heat exchanger is provided on each metal tank (see claim 2 of the reference) which implies that the heat exchanger can be located outside and on the metal tank.

The JP 60-68 A reference does not disclose that the solvent for exchanging heat is water, and that the fuel cell generates power while warming up the fuel cell when the temperature of the fuel cell is within a given temperature range whose upper limit is the prescribed temperature and the warming up is performed with no power generation when the temperature of the fuel cell is under the lower limit of the given temperature range. Although JP 60-68 A states that the heat exchanger can be located on the metal tank (see claim 2 of the reference in applicant's translation), the reference does not explicitly state that the heat exchanger is located outside of a tank containing the hydrogen-occlusion alloy.

Kralick teaches water as a heat exchange medium between a fuel cell and a heat exchanger (col. 5, lines 30-31) and that if the reactant gas entering the inlet is warmer than the fuel cell stack, condensation might occur as the saturated gas is cooled to the stack temperature (col. 5, lines 45-65).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use water as the solvent for exchanging heat between the fuel cell and the metal hydride tank 10 because water is commonly used in the art as a heat exchange medium in a

coolant circuit because water is non-corrosive, has high heat capacity, is non-toxic, and is easily replenished by the product water of the fuel cell.

It would have also been obvious to one of ordinary skill in the art at the time the invention was made to warm up the fuel cell to a given temperature without power generation or to warm up the fuel cell to a given temperature with power generation because the optimum condition of power generation depends on the relative temperature of the humidified reactant and the temperature of the fuel cell because if a humidified reactant gas entering the fuel cell has a higher temperature that the fuel cell temperature, condensation might occur and cause flooding of the fuel cell membrane that would be detrimental to power generation.

Aldhart et al. teach a fuel cell system with heat exchange between the coolant 74 and the metal hydride alloy tank which comprises two concentric containers 70 and 72 and the container 72 contains the metal hydride bed with container 70 surrounding container 72 and connected to the coolant system of the fuel cell stack (see Figure 6).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the metal hydride alloy tank of Aldhart et al. in the fuel cell system of JP 60-68 A because the heat exchange unit 72 of the metal hydride alloy tank located outside of and surrounding the metal hydride bed provides more space for hydrogen storage and more surface area for heat exchange with the metal hydride bed.

11. Claims 16 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over applicant's English Translation for JP 60-68 A submitted on 4/29/2004 in view of Kralick (US

6,350,535 B1) as applied to claim 15 above, and further in view of Pratt et al. (US 6,406,808 B1).

Applicant's English Translation for JP 60-68 A submitted on 4/29/2004 as modified by Kralick discloses all the limitations of claims 16 and 17 except that the hydrogen supplied to the fuel cell depends upon a target pressure of the anode of the fuel cell and that the hydrogen supplied to the fuel cell depends upon a target power generation for the fuel cell.

Pratt et al. teach that the amount of hydrogen released from the metal hydride container has to be controlled such that it matches the target power output, pressure, and concentration of hydrogen in the fuel cell system (col. 1, lines 60-65).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to supply the amount the hydrogen depending upon a target pressure of the anode (fuel) in order to reach a target power output to satisfy a load demand for a given application.

It would have also been obvious to one of ordinary skill in the art at the time the invention was made to supply the amount of hydrogen depending upon a target power generation in order to meet load demands for a given application.

12. Claims 16 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over applicant's English Translation for JP 60-68 A submitted on 4/29/2004 in view of Kralick (US 6,350,535 B1) and Aldhart et al. (US Patent No. 4,826,741) as applied to claim 15 above, and further in view of Pratt et al. (US 6,406,808 B1).

Applicant's English Translation for JP 60-68 A submitted on 4/29/2004 as modified by Kralick and Aldhart et al. discloses all the limitations of claims 16 and 17 except that the hydrogen supplied to the fuel cell depends upon a target pressure of the anode of the fuel cell and

that the hydrogen supplied to the fuel cell depends upon a target power generation for the fuel cell.

Pratt et al. teach that the amount of hydrogen released from the metal hydride container has to be controlled such that it matches the target power output, pressure, and concentration of hydrogen in the fuel cell system (col. 1, lines 60-65).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to supply the amount the hydrogen depending upon a target pressure of the anode (fuel) in order to reach a target power output to satisfy a load demand for a given application.

It would have also been obvious to one of ordinary skill in the art at the time the invention was made to supply the amount of hydrogen depending upon a target power generation in order to meet load demands for a given application.

Response to Arguments

13. Applicant's arguments filed 11/24/2004 have been fully considered but they are not persuasive.

With respect to the JP 60-68 A reference as modified by Kralick, applicant asserts that neither references suggest a cooling water that passes along the outside of a tank containing a hydrogen-occlusion alloy for generating heat and that Kralick uses water to remove heat from the fuel cell and not transfer heat from the water to the fuel cell and that the water of Kralick does not warm up the fuel cell.

In response, applicant's former argument regarding the placement of the cooling water is moot in view of the new grounds of rejection given above. The Examiner is not persuaded by

applicant's argument regarding how Kralick uses the cooling water because the water is used as a heat transfer medium by Kralick and water as a heat transfer medium is capable of both heating and cooling.

Conclusion

Any inquiry concerning this communication or earlier communications should be directed to examiner Susy Tsang-Foster, Ph.D. whose telephone number is (571) 272-1293. The examiner can normally be reached on Monday through Friday from 9:30 AM to 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached at (571) 272-1292.

The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

st/ Susy Tsang-Foster

Susy Tsang-Foster
Primary Examiner
Art Unit 1745